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ABSTRACT

This study compares the effects of Montessori methods of instruction and methods of direct verbal instruction. Montessori methods rely on the ability of the child to learn through physical interaction with inanimate objects and minimize verbal behavior by teacher and student, while the direct verbal method works mainly through language use, both in the teacher's presentation and the child's responses. In this research project, the Montessori group was made up of 17 upper-middle class 4-year-olds who had already participated in the program for a year. The direct verbal group, called the Academic Preschool, was comprised of 18 4-year-olds from backgrounds similar to those of the Montessori group. All the children were pre- and posttested on the Illinois Test of Psycholinguistic Abilities and posttested on the Wide-Range Achievement Test (reading, arithmetic and spelling). There were no significant between-group differences at pretest, and posttest total ITPA scores were about the same as the pretest scores. The subtest differences in the second testing favored the Academic Preschool on tests involving abstraction and the Montessori group on tests of simple recognition or memory. The Academic preschool children outscored the Montessori children in all areas of the Achievement Test. (MH)

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Direct Verbal Instruction Contrasted with Montessori Methods in the Teaching of Normal Four-Year-Old Children.

1. Purpose:

An experimental comparison between the methods of direct verbal instruction described in section 3.1 and Montessori methods of preschool education has several points of interest. The two approaches share certain common goals that are not shared by traditional approaches to preschool education. Both are concerned with teaching, with getting children to know things they don't already know. Both emphasize work instead of play. Both follow the principle of presenting sequenced tasks of increasingly more stringent criteria, so that the child has the experience of encountering and overcoming failure rather than being spared it altogether. More specifically, both attempt to teach mathematical concepts, reading, and spelling to preschool children.

In spite of this communality of goals and interests, the two approaches are diametrically opposed on almost every major point of method. The overriding difference, of course, is that direct verbal instruction works mainly through language both in the teacher's presentation and the children's responses, whereas Montessori methods are far to the opposite extreme, relying on the child's physical interaction with inanimate objects to accomplish most of the learning, verbal behavior by both teacher and child being minimized. In addition, Montessori places great emphasis on the child's freedom to select and pace his own activities, whereas in direct verbal instruction the selecting and

pacing are controlled by the teacher. Children usually work separately in Montessori schools, but in groups under direct verbal instruction. The atmosphere strived for in Montessori schools is one of library-like calmness and concentration, whereas with direct verbal instruction it is more one of gymnasium-like strenuous exertion.

The present experimental comparison was concerned with two issues: 1) whether the contrasting verbal and non-verbal emphases of the two methods would be reflected in differential gains on verbal and non-verbal performance measures and 2) whether direct, teacher controlled and paced instruction in basic academic subjects would produce different achievement results than the less direct and forceful instruction of the Montessori method. With respect to the first issue, it was expected that the Montessori group would show up better on non-verbal tests, the Academic Preschool group on verbal tests, except for the grammar and vocabulary subtests, where no difference was predicted. Since almost all of the children came from relatively privileged homes with highly educated parents, it was expected that those verbal measures that reflected fundamental language skills would not be materially affected by differences in school treatment. With respect to the second issue, it was expected that direct verbal instruction would lead to higher levels of mean performance on achievement tests, but that the variance of scores would be larger and negatively skewed for Montessori-trained children, indicating that most scored below the mean of the direct verbal instruction group, but that some scored as high as or higher than

the best of the direct verbal instruction group.

2. Method and procedure:

Subjects.

Subjects for the Montessori group were all the children enrolled in a local Montessori school who would be of kindergarten age the following academic year. This meant that they were between the ages of 3-10 and 4-10 at the time the experiment began. Nineteen children were so identified, of whom 2 were later excluded for reasons to be given. The school was a licensed Montessori school that had been in existence for two years, using trained Montessori directresses. Children in the Montessori school were largely from upper-middle-class homes with college educated parents.

The recruitment for a comparable group of children to receive instruction under the direct verbal instruction method was carried out somewhat unconventionally because of the special nature of the Montessori group. It would have been easy enough to have recruited a group from the same socio-economic background as the Montessori children, but there was reason to suppose that the parents of the Montessori children differed from the average in ways not indicated by their occupational and social status. The Montessori society was still young in the community and many of the parents had taken part in the original movement to start such a school. The writer attended one of the planning meetings and observed the parents to be exceedingly zealous over their children's intellectual advancement and convinced that regular

nursery schools were inadequate because they "didn't teach anything." It could be expected, therefore, that such parents would take an even more active role in their children's early education than is common for people of comparable station.

Accordingly, recruitment was carried out by telephoning parents of children in the Montessori school and securing from them names of parents whom they knew to be interested in the Montessori school and desirous of having their four-year-old in it, but who were unable to enroll him either because of the Montessori school's policy of not admitting children above the age of three years six months or because of the financial burden (tuition in the Montessori school being high by local standards). Some names were also obtained from the waiting list for admission to the Montessori school. Through this means 19 subjects were recruited, of whom one was subsequently lost by leaving the community.

One important difference, however, that could not be eliminated so long as inteact Montessori classes were used, was the fact that the Montessori children had already had a year or more of schooling in the Montessori school at the time the present study began, whereas none of the children in the direct verbal instruction group had been in school previously.

Educational Treatment:

Except for the testing to be described, the children in the Montessori school were experimentally untouched. The four-year-olds being studied were in two different classes, mixed in with a number of younger children and a few older ones, according to

the Montessori principle of avoiding age segregation. The school day was three hours.

The class to be taught by direct verbal instruction methods was started in mid-October, under the name of Academic Preschool. It followed approximately the same schedule of days as the Montessori schook, but the school day was only two hours. Initially the same basic program was followed as with the disadvantaged children the year previously -- three teachers each teaching a different subject in 20-minute sections to groups of children stratified according to level of attainment. The teachers were all new to the program. One had previously taught slow-learners in elementary school and another had taught high school English. The major departures from the plan used with the disadvantaged children were as follows:

1. Since the children in the present study were much more sophisticated in language usage than the disadvantaged children, the basic language program was presented only in the most summary form. Most of the time was devoted to the material on if-then reasoning from the advanced language program and to science topics that also involved verbal reasoning problems; e.g., problems involving opposing forces, problems involving deductions from the geological record.

2. A revised reading curriculum was used, employing the Initial Teaching Alphabet. The new curriculum included early introduction of rhyming and first-letter phonics to distinguish rhyming words, early introduction of sentence reading with a small set of sight words, and very systematic drill on spelling

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patterns.

3. Initially the arithmetic curriculum was modified to accomodate early introduction of negative numbers. However, teaching difficulties required an eventual retreat back to the arithmetic program as used with the disadvantaged children.

4. Printing (in i.t.a.) was taught informally but regularly as one of the between-class activities.

5. After four months a fourth subject was added, experimental science, in which a number of short units centering around demonstrations and problems in rule-application were tried out. These included units on plant physiology, weather, and geology.

6. At this same time the class was divided into four groups for reading instruction instead of the usual three because four children had gotten too far ahead of the others in reading to profit from the same instruction as the others were receiving.

7. The original schedule of spreading the instructional sessions over two hours by sandwiching periods of semi-strictired activity between them was gradually modified until the instructional periods were run one immediately after the other, the less structured activities being all shoved to the end of the day.

Testing:

The Illinois Test of Psycholinguistic Abilities (ITPA) was administered both as a pretest and as a posttest. The first administration was carried out approximately six weeks after the beginning of the Academic Preschool. One child in the Montessori school refused to be tested on this and later occasions and was

therefore dropped from the sample. Another Montessori child obtained a standard score on the total test that was 1.2 standard deviations below that of any other child in either group (a gap four times greater than any other in the score distribution) and therefore was excluded as a case lying outside the range to which results of the study might be generalizable. The ITPA was readministered to both groups approximately six months later.

At the latter time an individual achievement test was also administered, the Wide-Range Achievement Test, which provides grade level scores for reading, arithmetic, and spelling that range down as far as the beginning kindergarten level (0.1). The reading test consists entirely of sight vocabulary words, except for some alphabet recognition items at the lowest levels. Because both the Montessori children and those in the Academic Preschool had been taught to identify letters by sound rather than name (although many of them had learned the names at home), the scoring policy was followed (which is admissible under the rules for administering the test) of giving credit for all the letter identifications providing the child recognized one or more words. The words were presented on the standard test forms to both groups--that is, in traditional orthography, with lower-case letters--even though the Academic Preschool children had been taught with the Initial Teaching Alphabet. The arithmetic test consisted of 15 orally administered items and had a ceiling score of 2.0 grade level. The spelling test consisted of individual words graded in difficulty and was scored conventionally. Thus, words spelled correctly in the Initial Teaching Alphabet were <u>not</u>--counted as

correct, unless the spelling happened to conform exactly to conventional orthography.

3. Results

Pretest Results:

Table 1 gives a comparison of the pretest scores on the ITPA for the Montessori and Academic Preschool groups. The data are in standard scores fitted to the nearest month of chronological age by means of linear interpolation in the norm tables. Separate t-tests were run on each ITPA subtest as well as on total score. None of the differences was significant even at the .10 level, even though with 10 comparisons one of the differences could have been expected to reach that level by chance. Thus the groups may be regarded as not differing significantly, either in overall level of test performance or in particular subtests. The testers inadvertently missed two children in the Academic Preschool and the oversight was not made known until it was too late to obtain usable pretest scores. These two children are left out of further analysis of ITPA scores; however, their scores on the posttest would indicate that they were slightly below the average of their group, so that their inclusion in the pretest comparison could have been expected to diminish rather than augment the overall difference.

ITPA Posttest Results:

Analysis of covariance was used to remove some of the experimental error due to within-group differences and (presumably) random between-group differences shown on the pretest. A single

Table 1 - ITPA Pretest Standard Scores for Direct Instruction and Montessori Groups

	Group				
	Direct Instruction (N=16)		Montessori (N=17)		
	Mean	S.D.	Mean	S.D.	t*
1. Aud. Decoding	1.01	.81	.75	.66	.99
2. Vis. Decoding	.45	.68	.78	.62	1.41
3. Aud-Voc. Assoc.	1.33	.69	1.40	.69	.29
4. Vis-Mot. Assoc.	.11	.68	.17	.74	.24
5. Voc. Encoding	1.01	.90	.65	.77	1.19
6. Mot. Encoding	.20	.70	.41	.84	.76
7. Aud-Voc. Automatic	.84	.86	.61	.53	.90
8. Aud-Voc. Sequential	.98	.92	.78	.95	.60
9. Vis-Mot. Sequential	.75	.74	.83	.49	.37
Total Score	1.33	.61	1.28	.67	.22

*t of 1.70 required for significance at .10 level

Table 2 - Adjusted and Unadjusted Posttest Means on ITPA

	Group					
	Direct Inst. (N=16)		Montessori (N=17)			
	Unadj. Mean	Adj. Mean	Unadj. Mean	Adj. Mean	Adj. Mean Differ.	P*
1. Aud. Decoding	1.81	.78	.72	.74	.04	n.s.
2. Vis. Decoding	.23	.25	.79	.78	-.53	<.05
3. Aud-Voc. Assoc.	1.64	1.67	1.16	1.13	.53	<.01
4. Vis-Mot. Assoc.	.96	.97	.51	.49	.48	<.25
5. Voc. Encoding	.93	.89	.36	.40	.49	<.25
6. Mot. Encoding	.12	.18	.26	.20	-.03	n.s.
7. Aud-Voc. Automatic	.87	.81	.73	.78	.03	n.s.
8. Aud-Voc. Sequential	.90	.83	.82	.89	-.06	n.s.
9. Vis-Mot. Sequential	-.39	-.37	-.10	-.13	-.24	n.s.
Total Score	1.40	1.38	1.17	1.19	.19	n.s.

*P based on analysis of covariance of posttest scores, controlling for corresponding pretest scores (d.f. = 1.30).

repeated-measurements design using corresponding subtest scores in the pretest as the covariate, was intended, but preliminary tests showed significant heterogeneity of regression among the ITPA subtests ($p < .01$), thus making it unreasonable to base all adjustments on the same regression coefficient. Accordingly, a separate analysis of covariance was run for each subtest as well as for total test score. Tests on within-groups regression coefficients showed no significant heterogeneity at the .10 level on any test. Table 2 reports the posttest means and adjusted means, along with F values for the analyses of covariance.

On total test score, the groups differed hardly at all. In fact, there was practically no change for either group from the pretest scores--a gain of..07 standard score points for the Academic Preschool group and a loss of .11 for the Montessori group. On two of the subtests, however, there were significant adjusted posttest differences. One is a difference of half a standard score unit in favor of the Academic Preschool group on Auditory-Vocal Association and the other is a difference of equal magnitude in favor of the Montessori group on Visual Decoding. Auditory-Vocal Association is a verbal analogies test. Visual Decoding is a test in which the subject is briefly shown a picture of an object and then must locate an object of the same identity in another picture. Two other differences approached significance, both being on the order of half a standard score unit. Both differences were in favor of the Academic Preschool group. One was on Vocal Encoding, a test that requires the sub-

ject to "tell all about" objects that are given him, the score being the number of different attributes he names. The other was Visual-Motor Association, a picture analogies test.

An overall comparison of performance on verbal and non-verbal subtests reveals the following: on verbal subtests (1,3,5,7,8) the Montessori group declined an average of .08 standard score points from pretest to posttest, while the Academic Preschool group showed no change. On the non-verbal subtests (2,4,6,9) the Montessori group showed a decline of .18 while the Academic Preschool group showed a decline of .04. The differences between groups from this perspective are minute and contrary to the expectation that the contrasting verbal and non-verbal treatments given the two groups would be reflected positively in ITPA subtest changes.

Another comparison was run which, because of its glaringly <u>a posteriori</u> nature, must be taken with some salt. However, it represents a way of looking at ITPA profiles that may be more meaningful for normal children than the diagnostic categorizations developed for exceptional children. Subtest scores are assigned weights according to the amount of information processing as contrasted with rote or automatic reproduction that they seem to call for. The two analogies tests, Auditory-Vocal Association and Visual-Motor Association, are assigned weights of +4. Auditory Decoding (a vocabulary test requiring a judgment as to whether a given statement can be true or not) and Vocal Encoding (described above) are assigned weights of +2. Visual Decoding

(described above), Auditory-Vocal Automatic (grammatical usage), and Motor Encoding (showing by pantomime what to do with pictured objects) are weighted -2; and the two immediate memory tests, Auditory-Vocal Sequential and Visual-Motor Sequential, are weighted -3. Thus the composite score has an expected value of zero, positive scores indicating a tendency to score higher on tests requiring information processing than on more automatic tests, negative scores indicating the opposite tendency.

Mean scores for the two preschool groups on this composite were positive for both pretest and posttest. On the pretest, the Academic Preschool group obtained a mean score of 1.48 and the Montessori group a mean of .53. The difference was not significant (t=.55, d.f.=31). On the posttest, the mean for the Academic Preschool group rose to 8.93 and the mean for the Montessori group rose to 2.70. An analysis of covariance (controlling for pretest score) showed this posttest difference to be significant at the .02 level (F=7.22, d.f.=1,30).

Achievement Test Results:

Table 3 presents means, standard deviations, and ranges for achievement test scores. As predicted, the Academic Preschool children were significantly superior in all three areas. The Montessori group showed greater variance in scores on two of the three tests. The difference was significant (by F test) at the .01 level in arithmetic and at the .05 level in spelling. On reading, however, the variance was insignificantly greater for the Academic Preschool group. The range was curtailed in the

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arithmetic test by a ceiling of 2.0 grade level. Two children in the Academic Preschool group and one in the Montessori group reached this ceiling.

Table 3 - Means, standard deviations, and ranges of scores on Wide-Range Achievement Test (grade-level scores)

	Group							
	Direct Instruction (N=18)			Montessori (N=17)				
	Mean	S.D.	Range	Mean	S.D.	Range	t	p
Reading	2.43	.68	1.4-3.7	1.05	.62	.0-2.6	6.30	.005
Arithmetic	1.46	.22	1.2-2.0	1.19	.40	.3-2.0	2.45	.025
Spelling	1.72	.32	1.0-2.2	1.25	.51	.8-2.5	3.62	.005

Contrary to expectations, the Montessori group did not show marked negative skewness in scores, except in spelling. As a crude comparison of skewness, the number of children in each group scoring above and below their respective group means was compared by a chi-square test. In reading, the Academic Preschool group was evenly divided and the Montessori group was divided 9 above and 8 below--clearly not a significant difference, with no skewness in either group. On arithmetic, scores for the Academic Preschool group were negatively skewed--5 above and 13 below, while for the Montessori group they were positively skewed--10 above and 7 below. The difference fell short of significance at the .10 level, however. On spelling, the results were reversed--11 above and 7 below for the Academic Preschool group and 5 above and 12 below for the Montessori group. Again, the difference was not significant.

4. Discussion:

The two major questions in this study were 1) whether the differences between the highly verbal training given in the Academic Preschool and the highly non-verbal training given in the Montessori school would be reflected in differential gains on verbal and non-verbal ITPA subtests, and 2) whether the differences in treatment would result in differences in academic achievement.

The ITPA differences obtained seem to be better accounted for on the basis of the amount and kind of information processing required of children in the two schools rather than on the basis of modality. Thus, of the three tests on which the Academic Preschool children most exceeded the Montessori children, one is non-verbal, but all have in common the following elementary task requirement: the child, on being presented a stimulus (either verbal or non-verbal), must abstract some characteristic or characteristics from it according to criteria of task relevance. The one subtest on which the Montessori children did significantly better, Visual Decoding, was superficially very similar to the Visual-Motor Association subtest, on which the direct instruction group was superior. On Visual Decoding, however, the child does not need to abstract any attribute; he need only recognize the object shown and then locate another object of the same identity (whereas on Visual-Motor Association he must locate an object that "goes with" the stimulus object--i.e., that is related to it by use, class membership, etc.).

One of the peculiarities of Montessori instruction, besides

it's non-verbal character, is that most of the abstraction is done for the child rather than by him. If he is to attend to length, color, or pitch, then all the attributes of the stimulus objects are held constant except length, color, or tone. In our program, the same principle is used in introducing new concepts, but instruction always goes on from there to insure that the new dimension, attribute, or class is distinguished from others. Thus, the child is eventually taught to deal with abstractions under normal conditions. Informal nursery school teaching usually presents normal ("noisy") conditions from the beginning, thus making abstraction difficult; but it seems as if the Montessori method may go too far the other way in isolating concepts. In any event, it appears from the present results that Montessori-trained children do not do better on non-verbal tasks <u>per se</u>, but only on non-verbal tasks that have a minimum of conceptual content.

The differences in achievement in reading, arithmetic, and spelling were sizable, although the Montessori children did not do badly for four-year-olds, scoring at the first-grade level or above on every test. By comparison, however, in another study carried out simultaneously with this one and covering the same time-span, disadvantaged four-year-olds given the direct instruction curriculum earned scores almost identical with those of the considerably more privileged Montessori group, while disadvantaged children given a typical nursery school program earned scores at about the .5 grade level.

Only one child in the Montessori group could be said to know

how to read, scoring above the 2.0 level on both reading and spelling. Thirteen of 18 children in the Academic Preschool scored at the second grade level or above in reading, and four did so in spelling. (The discrepancy between reading and [illegible] ance being [illegible] attributed to use of the i.t.a. alphabet in instruction and traditional orthography in testing.)

One possible objection to the results of this study is that the Academic Preschool children received a type of training that merely disposed them to do better on tests generally--to be more acquiescent in the testing situation and to try harder, perhaps. Thus, the Montessori children may have known more than they revealed. This objection cannot be ruled out. To be sure, the two groups did equally well on the ITPA pretest and posttest, but the Academic Preschool children had already had six weeks of schooling at the time of the pretest, so that they may already have acquired some of these favorable test-taking behaviors. From this it would have to follow, however, that the Montessori children were actually better in ITPA abilities from the beginning. If one grants this objection, therefore it makes the achievement differences appear greater even than the scores indicate.

Comparing the present study with the earlier one on disadvantaged children, two differences emerge. One is that for children from language-rich environments, direct verbal instruction has little impact on language abilities, whereas it has a considerable impact for disadvantaged children. A higher-level language program (one that dealt with more advanced grammatical con-

[illegible] [illegible] [illegible] [

structions, etc.) might have an impact, but it is questionable whether it would be a profitable use of instructional time. The other difference was in reading, the middle-class children making far greater progress than the disadvantaged children in the same length of time. This issue was discussed in the preceding report. The implication for educating middle-class children, however, is that reading seems to come easily enough for four-year-olds that there is little reason to delay it another two years.

5. Summary

A direct verbal instruction program of seven months' duration was given to a group of 18 four-year-olds, chosen to be comparable with an equal-sized group of four-year-olds who were undergoing their second year of education in a Montessori school. The Illinois Test of Psycholinguistic Abilities was administered as a pretest and posttest, and the Wide-Range Achievement Test as a posttest only. On the pretest, administered six weeks after the beginning of instruction for the direct instruction group, there was no significant standard-score difference at the .10 level either in total score or subtest scores. Total standard scores on the ITPA remained nearly constant for both groups from pretest to posttest. Using pretest score as a covariate, however, there was a significant posttest difference in favor of the direct instruction group on the Auditory-Vocal Association subtest and in favor of the Montessori group on the Visual Decoding subtest. There was, however, no general interactive tendency; instead of the Montessori group doing relatively better on the non-verbal

subtests and the direct verbal instruction group doing better on the verbal subtests, the direct instruction group did sinsignificantly better on both types. The only discernible pattern difference seemed to do with amount of information processing required rather than with modality: the direct instruction group did relatively better on tests involving abstraction, whereas the Montessori group did relatively better on tests of simple recognition or memory. An a posteriori analysis, using composite scores weighted on this dimension, yielded a significant difference.

On the Wide-Range Achievement Test the direct instruction group significantly surpassed the Montessori group in all areas. Mean grade-level scores for the direct instruction group and the Montessori group, respectively, were 1.46 and 1.19 on arithmetic, 3.43 and 1.01 on reading, and 1.72 and 1.25 on spelling.

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